REMARKS

Claim Amendments

The amendments to claims 1 and 5 are supported on Table 1-1 on page 23 and Table 1-2 on page 24 of the specification. The amendment to claim 5 involving the area percentage of ferrite and martensite is supported on page 6, lines 16 to 22 of the specification. No new matter has been added.

Applicants' Present Claims

The present claims are directed to a high tensile cold-rolled steel sheet consisting essentially of 0.04 to 0.13% C, 0.3 to 1.2% Si, 1.0 to 3.5% Mn, 0.04% or less P, 0.01% or less S, 0.02 to 0.07% Al, 0.005% or less N, by mass, and a balance of Fe and inevitable impurities; having a microstructure containing 50% or larger area percentage of ferrite and 10% or larger area percentage of martensite, and having a ratio of intervals of the martensite in the rolling direction to those in the sheet thickness direction of 0.85 to 1.5; and having a nano strength of the martensite of 8 GPa or larger (see applicants' present claim 1).

The present claims also pertain to a method for manufacturing high tensile cold-rolled steel sheet, comprising the steps of: hot-rolling a steel slab consisting essentially of 0.04 to 0.13% C, 0.3 to 1.2% Si, 1.0 to 3.5% Mn, 0.04% or less P, 0.01% or less S, 0.02 to 0.07% Al, 0.005% or less N, by mass, and a balance of Fe and inevitable impurities, into a steel

sheet, followed by coiling at a coiling temperature ranging from 450°C to 650°C; cold-rolling the coiled steel sheet at a cold-rolling reduction ranging from 30 to 70%; annealing the cold-rolled steel sheet by heating to a temperature range of [the coiling temperature + the cold-rolling reduction percentage x 4.5] to [the coiling temperature + the cold-rolling reduction percentage x 5.5] (°C); and cooling the annealed steel sheet to a temperature of 340°C or below at an average cooling rate of 10°C/s or higher, thereby manufacturing a high tensile cold-rolled steel sheet having a microstructure containing 50% or larger area percentage of ferrite and 10% or larger area percentage of martensite, and having a ratio of intervals of the martensite in the rolling direction to those in the sheet thickness direction of 0.85 to 1.5; and having a nano strength of the martensite of 8 GPa or larger (see applicants' present claim 5).

The steel sheets provided by applicants' present claims are desirably used as reinforcing members of pillars and dashboards of automobiles.

Claim Objection

Claim 5 was objected to for the reason set forth in item No. 5 bridging pages 2 to 3 of the Office Action. Claim 5 was amended to avoid the objection. Withdrawal of the objection is respectively requested.

Obviousness Rejection Under 35 USC 103

Claims 1 to 8 were rejected under 35 USC 103 as being unpatentable over the machine translation of JP 2002-226937 for the reasons set forth in item no. 7 on pages 3 to 8 of the Office Action.

It was admitted in the Office Action that JP 2002-226937 differs from claim 1 in that it does not disclose the ratio of the intervals of martensite in the rolling direction to those in the sheet thickness direction or the nanostrength of martensite.

It was also admitted in the Office Action that JP 2002-226937 differs from claim 5 in that it does not teach the annealing temperature range recited in claim 5.

It was further admitted in the Office Action that JP 2002-226937 differs from claim 5 because JP 2002-226937 does not disclose the ratio of intervals of the martensite in the rolling direction to those in the sheet direction or the nanostrength of the martensite.

JP 2002-226937 does not teach or suggest the following inventive feature of applicants claims 1 and 5, namely 0.005% or less N.

Paragraph [0022] of JP 2002-226937 discloses that 0.006 to 0.020% N is necessary. The content of the foregoing teaching is contrary to applicants' presently claimed invention.

It is respectfully submitted that the foregoing teaching in JP 2002-226937 constitutes a "teaching away", which is compelling evidence of non-obviousness. The JPO (Japan Patent

Office) machine translation of paragraph [0022] of JP 2002-226937 explains the foregoing matter as follows:

> "[0022] N: 0.006 - 0.020 %N Post forming intensity rise heat treatment ability sufficient at less than 0.0065 is not obtained, but it is one side. Since a blow hole will occur at the time of steel manufacture and press-forming nature will fall if N is made to contain exceeding 0.020%, it is N. It is limited to 0.006 to 0.02% of range. It is desirable. It is 0.008 to 0.019% of range."

JP 2002-226937 is directed to an art of securing, by utilizing a mutual interaction between solid solution N and dislocation, a steel sheet having an excellent capability of increasing strength. This is obtained by a heat treatment performed after forming. Inclusion of a solid solution N of 0.0015% or more is an indispensible condition of JP 2002-226937. For meeting this requirement, N in a large amount of 0.006 to 0.020% is required in JP 2002-226937. At the same time, N forms a chemical compound AlN and therefore, for the purpose of preventing a solid solution N from decreasing, the Al content is limited to a small amount as possible. The content of Al in JP 2002-226937 is only 0.005 to 0.02% Al. Said content of Al is extremely small when compared with the Al content of 0.02 to 0.07% recited in applicants' claims 1 and 5. The JPO machine

translation of paragraph [0021] of JP 2002-226937 explains the foregoing matter as follows:

> "[0021] Although aluminum is added as a deoxidizer aluminum: 0.005 to 0.02% for the improvement in the yield of a carbon nitride forming component, an addition. There is not effect sufficient or less than 0.005%, and since the amount of N to be added will increase in steel if it exceeds 0.02% on the other hand, yield hit of N at the time of steel manufacture becomes difficult."

While the N(%)/Al(%) according to applicants' claims 1 and 5 is 0.25 or less, N(%)/Al(%)$\geq$ 0.3 is an indispensable condition according to JP 2002-226939. In this regard see the following paragraph [0023] of the JPO machine translation of JP 2002-226937:

> "[0023] N(%)/aluminum(%)N plays the important role which gives post forming intensity rise ability to a steel plate in this invention as mentioned above >=0.3.for that purpose, the ratio of N content to Al content -- it is necessary to make N(%)/aluminum (%) or more into 0.3 because, in order to be stabilized and to make 0.0015% or more of dissolution N remain regardless of change of manufacturing conditions. As a result of reaching far and wide and examining N about combination with aluminum which is an element fixed powerfully, in order to be stabilized and to make dissolution N with a final product into 0.0015% or more, they are N(%)/aluminum(%). It is because it became clear that it needed to be referred to as >=0.3."

As has been explained hereinabove, JP 2002-226937 provides a teaching which is the opposite of that of the applicants' present claims 1 and 5. As is clear from Table 3-1 and Table 3-

2 of applicants' specification, the presently claimed invention provides advantageous results.

Table 3-1 on page 27 of the present specification is reproduced as follows:

Table 3-1

Steel sheet No.	Steel No.	Tensile strength (MPa)	Elongation (%)	Area percentage of ferrite (%)	Area percentage of martensite (%)	Area percentage and kind of other phase (%) (kind)	Ratio of intervals of martensite	Nano hardness of martensite (GPa)	TS*El balance (MPa·%)	Absorbed energy* ($MJ \cdot m^{-3}$)	Absorbed energy* per TS 1 MPa ($MJ \cdot m^{-3} \cdot MPa^{-1}$)	Remark
1	A	843	19.5	70	30	0	1.36	9.4	16439	88.8	0.105	Example
2	A	820	18.9	75	25	0	0.71	9.3	15498	77.9	0.095	Comparative example
3	B	886	18.1	60	40	0	1.50	8.0	16037	88.8	0.100	Example
4	B	852	17.8	70	30	0	1.59	7.2	15166	78.4	0.092	Comparative example
5	C	821	21.6	65	35	0	1.26	10.5	17734	94.4	0.115	Example
6	C	842	18.3	55	45	0	1.57	10.2	15409	79.1	0.094	Comparative example
7	D	708	24.0	80	20	0	1.13	9.3	16992	75.8	0.107	Example
8	E	621	27.1	80	20	0	1.21	9.5	16829	65.8	0.106	Example
9	E	673	23.2	70	30	0	1.57	7.4	15614	62.6	0.093	Comparative example
10	F	834	21.8	70	30	0	1.29	11.6	18181	100.1	0.120	Example
11	F	808	19.1	70	30	0	1.29	7.2	15433	75.1	0.093	Comparative example
12	G	867	20.6	60	40	0	1.15	12.7	17860	104.9	0.121	Example
13	G	821	18.8	60	40	0	1.15	7.5	15435	78.8	0.096	Comparative example
14	H	849	21.5	65	35	0	0.95	12.1	18254	100.2	0.118	Example
15	I	854	19.7	75	25	0	1.02	9.6	16824	90.5	0.106	Example
16	J	803	23.1	80	20	0	1.20	10.6	18549	95.6	0.119	Example
17	K	857	20.9	75	25	0	1.05	12.7	17911	99.4	0.116	Example
18	L	754	21.5	85	15	0	1.33	9.7	16211	80.7	0.107	Example
19	M	839	21.5	65	35	0	1.10	11.2	18039	96.5	0.115	Example
20	M	880	17.6	55	45	0	1.59	10.2	15488	83.6	0.095	Comparative example

* Underline designates outside the range of the invention.

Table 3-2 on page 28 of the present specification is reproduced as follows:

Table 3-2

Steel sheet No.	Steel No.	Tensile strength (MPa)	Elongation (%)	Area percentage of ferrite (%)	Area percentage of martensite (%)	Area percentage and kind of other phase (%) (kind)	Ratio of intervals of martensite	Nano hardness of martensite (GPa)	TS*El balance (MPa•%)	Absorbed energy* (MJ•m⁻³)	Absorbed energy* per TS 1 MPa (MJ•m⁻³•MPa⁻¹)	Remark
21	N	892	21.1	60	40	0	1.00	13.4	18821	107.9	0.121	Example
22	O	822	22.7	70	30	0	1.27	12.1	18659	97.0	0.118	Example
23	P	849	21.0	65	35	0	1.25	11.8	17829	97.6	0.115	Example
24	Q	531	29.2	95	5	0	1.72	7.6	15505	52.0	0.098	Comparative example
25	R	793	18.2	75	25	0	1.58	7.4	14433	75.3	0.095	Comparative example
26	S	559	27.1	85	15	0	1.73	7.2	15149	52.5	0.094	Comparative example
27	T	973	14.3	60	40	0	1.62	7.8	13914	89.5	0.092	Comparative example
28	U	1054	13.9	45	55	0	1.67	9.5	14651	97.0	0.092	Comparative example
29	G	825	20.1	60	40	0	1.15	8.9	16583	89.1	0.108	Example
30	V	639	26.3	70	25	5 (bainite)	1.14	8.5	16806	66.5	0.104	Example
31	W	789	21.2	73	18	9 (bainite)	1.18	9.3	16727	86.0	0.109	Example
32	H	783	21.5	63	30	7 (bainite)	0.95	12.1	16835	82.2	0.105	Example
33	X	877	21.5	56	44	0	1.00	12.2	18856	108.7	0.124	Example
34	P	881	21.4	62	38	0	1.02	13.3	18853	107.5	0.122	Example
35	P	910	18.1	43	55	2 (bainite)	1.05	7.3	16471	82.8	0.091	Comparative example
36	Y	622	26.2	90	10	0	1.45	7.1	16296	57.8	0.093	Comparative example
37	Y	701	27.2	74	24	2 (austenite)	1.05	10.3	19067	85.5	0.122	Example
38	Z	825	22.2	82	18	0	1.17	10.7	18315	92.4	0.112	Example
39	ZZ	873	21.3	72	28	0	1.22	10.8	18595	98.6	0.113	Example

* The value up to 10% strain at 10 s^{-1} of strain rate.

* Underline designates outside the range of the invention.

The results set forth in applicants' Table 3-1 and Table 3-2 are discussed as follows. The high tensile cold-rolled steel sheet Nos. 1, 3, 5, 7, 8, 10, 12, 14 to 19, 21 to 23, 29 to 34, and 37 to 39, which are the examples of the present invention, showed the following: (i) a 590 MPa or higher tensile strength; (ii) a 16000 MPa·% or higher excellent strength-elongation balance; (iii) a 59 $MJ \cdot m^{-3}$ or higher absorbed energy up to a 10% strain at $10s^{-1}$ of a strain rate; and (iv) a 0.100 $MJ \cdot m^{-3}$/MPa or higher absorbed energy up to 10% strain per 1 MPa of tensile strength. These attributes result in excellent crashworthiness.

It is therefore respectfully submitted that a person of ordinary skill in the art would not arrive at the presently claimed invention and the advantageous results obtained therefrom based on the disclosure of JP 2002-226937.

Withdrawal of the 35 USC 103 rejection is thus respectfully requested.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,

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